ANCER

TIPE DIAGNOSIS
AND CURE

BY

FRANCIS C. WOOD, M.D.

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FUNK & WAGNALLS COMPANY, Publishers
NEW YORK and LONDON

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CANCER

NATURE, DIAGNOSIS, AND CURE

BY

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THE NATIONAL HEALTH SERIES

EDITED BY

THE NATIONAL HEALTH COUNCIL

FUNK & WAGNALLS COMPANY

NEW YORK AND LONDON

Printed in the United States of America
Published, October, 1923

INTRODUCTION

An acquaintance, begun twenty-five years ago in the College of Physicians and Surgeons in New York and association in the conduct of the organized effort to control cancer in America, offers me exceptional opportunity to speak appreciatively of the author of this little book.

It has been remarked that scientific experts are of two types: those who are able to carry on successful researches of their own and those who can make successful use of the researches of others. Dr. Wood is of both types. And it is well that he is so, for the conditions which lead to the formation of cancer need investigation by persons of the greatest skill and the application of this knowledge to the prevention of suffering and death calls for a rare endowment of knowledge and practical ability.

It would be difficult to say in which of these two fields the author is the more distinguished. He is the head of the greatest institution for the investigation of cancer in existence—the Institute for Cancer Research of Columbia University—and the director of the department of radiotherapeutics of St. Luke's Hospital, one of the largest and best equipped hospitals in New York. He is a member of the executive committee of the American Society for the Control of Cancer, which is the foremost organization seeking to protect the public at large through the utilization of helpful facts about cancer.

In perusing this interesting book the reader may feel confident that he is being led to view the sub-

ject of cancer in a most authoritative and unprejudiced way.

GEORGE A. SOPER, PH.D.,
Managing Director,
American Society for the Control of Cancer.

New York, *September*, 1923.

CONTENTS

CANCER:

CHAPTER I

FOREWORD

IN the year 1920 the United States contained some 106,000,000 people. The health rate is constantly improving and is surpassed by only a few countries in the world. While the total number of deaths among the whole population is known with fair correctness, the causes of such deaths are accurately known only for a population of 87,000,000 comprising the people in the States of the so-called Registration Area. The records of the remaining States, fourteen in number and occupying half the area of the country, are so incomplete that they do not warrant deductions as to the causes of death occurring in their population. But in the Registration Area itself there were 72,931 deaths from cancer and other malignant tumors, a rate of 83.4 persons per 100,000 of the population. There is, however, no valid reason why these figures representing 82 per cent. of the population should not be applied to the whole population, which means that at least 88,400 persons died of cancer in the United States in 1920. This death rate represents an increase of nearly 10 per cent. over that of 1910.

In the rural districts many cases of cancer escape detection because of the lack of physicians and facilities for making accurate diagnoses. Also, even

in the better hospitals with excellent professional staffs and equipment, it has been shown that when post-mortem examinations are made as a routine, cancer is found in some 20 per cent. of those in whom the disease was not previously suspected.

It may be very properly assumed that city records furnish more accurate figures of the cancer death-rate than the country districts, because physicians and hospitals are more numerous and special facilities for diagnosis are available. The average city rate in 1920 was 99.8 deaths per 100,000. If this rate is possibly still 20 per cent. too low, as stated above, the correct death rate for the country at large would be at least 120 per 100,000, or the deaths from cancer in the United States may be assumed to be close to 125,000 persons in 1920.

If the further fact be mentioned that cancer is one of the most important causes of death in persons over the age of 45 in this country, the seriousness of the situation which now confronts us needs no further illustration. The exact figures for the Registration Area in 1920 for both sexes are: chronic heart disease, 104,360; cancer, 61,857; Bright's disease, 61,643; tuberculosis, 26,801. Among women above 45, the cancer proportion is higher, 34,598 dying during 1920 of that disease, and 48,517 of heart trouble. The general death rate, on the other hand, is diminishing, for it was lower in 1920 than in any year except 1919. Hence it is evident that if the cancer rate is rising, the rates for other causes of death are falling. This is especially evident in diseases like tuberculosis, typhoid, and other infectious conditions in which the results of public health education and the application of sanitary methods have produced a decided effect.

The facts just cited are so important that a renewed impulse has been given not only to the statis-

tical study of cancer from a public health aspect, but also experimentally in research laboratories. Great interest has also been concentrated upon attempts to find a cure for cancer, especially as the introduction of radium and X-ray has given us two agents of great value in the treatment of the disease, even tho not necessarily curative.

It is generally conceded that one of the most important reasons for the high mortality from cancer is that the disease is permitted to reach an advanced stage without recognition, because of the ignorance of people in general concerning the symptoms of cancer combined with a widespread pessimism as regards the possibility of a cure; a belief which inhibits those who know they have cancer from applying for medical assistance. Consultation with a physician is therefore postponed for either of these reasons until the disease is in such a stage that it can not be cured except in a few instances. The combined powers of surgery, X-ray, and radium have therefore as yet made no impression on the recorded cancer death rate, the continued rise of which in the last twenty years has masked the beneficial results of surgery and other forms of treatment. This serious situation is not confined to the United States, but exists the world over. The success of publicity campaigns devoted to informing people of the symptoms and nature of tuberculosis having resulted in such a marked fall in the death rate of that disease, the same method is now being used with cancer.

In the United States, the American Society for the Control of Cancer, founded in 1913, has been conducting an active campaign of information to instruct people as to the nature of the disease, the symptoms, and the importance of consulting a physician at the earliest possible moment, when any sus-

picion exists of a cancer anywhere in the body.[1] The results of the efforts of this Society have been very strikingly effective in increasing the number of applications for treatment by persons with early cancer, but the evidence is clear that this improvement is confined chiefly to the population of the larger cities where people can be reached more easily by publicity methods, and has not yet become effective in the country districts. The Society through its "Cancer Week," the observance of which has now become general throughout the United States, is endeavoring to overcome this handicap. Many of the European countries are carrying on similar campaigns with equally good results, but the benefit which is obtained for the few is masked still by the great natural increase in the number of recorded cases. A diminution in the cancer death rate, therefore, can not be expected until the entire population of the United States is prepared to take advantage of the knowledge which the Society and the physicians who collaborate with it offer to the public.

All improvement must be due to individual, personal effort. Cancer is not an epidemic disease which can be controlled by public health or police methods: it is rather a question of personal hygiene and personal understanding of the conditions under which cancer arises. The individual himself must take the necessary preliminary steps to place himself in proper hands in order that he may be cured of the disease when it is still in an early stage. Coincident with these educational efforts there has been great improvement in the methods of diagnosing internal cancer, which is the most frequent and dangerous type of the disease. But despite all efforts

[1]The publications of the Society and details of its organization may be obtained by writing to The American Society for the Control of Cancer, 370 Seventh Avenue, New York City.

of physicians to improve the diagnosis of this type of tumor, the mortality is still extremely heavy. The National Health Council has therefore thought it wise to have prepared a pamphlet which will give sufficient information concerning the nature, symptoms, and the treatment of cancer to enable anyone to inform himself and benefit thereby. This is the motive for the preparation of this small volume.

CHAPTER II

OCCURRENCE OF CANCER

THE wide prevalence of cancer is not confined to the United States. It occurs in all peoples, for despite the frequent statement that cancer is a disease of civilization, investigation reveals that even the tribes which we designate as uncivilized suffer from it.

The occurrence of numerous types of tumor in both wild and domesticated animals also points out that it is not necessarily the result of what we call civilization. Cancer was reported as not occurring in wild animals or in the uncivilized races by early travelers who did not know that cancer is a disease of age. Few wild animals or wild people survive to old age. Those who are diseased disappear and die. The same difference is seen in the cancer rates in highly civilized and less civilized countries. For example, Switzerland, Denmark, and Holland have the highest cancer death rates. Russia, on the other hand, has one of the lowest. Must we necessarily assume that it is more frequent among the Swiss than among the Russians? Not at all. There has never been a complete census taken in Russia, so that it is not known exactly how many people are alive in that country. Nor is the age distribution of the population known, that is, the number of people alive between the ages of 40 to 45, or between the ages of 45 to 50. Now if Russia is made up largely of young people and Switzerland of older people, say above the age of 45, obviously, tho the *cancer rate*

for the given ages would not differ, the total number of cancers as reported would be very different, Russia having a very low percentage rate, and Switzerland a very high one. The same reasoning can be applied to certain anomalous situations in this country where the states of Maine, Vermont, New Hampshire, and Massachusetts have an extremely high cancer rate, obtained by comparing the number of cases of cancer to the total population, while states like Montana, Utah, Idaho, have a very low rate. But if the distribution of the ages of the population was studied, it would be found that there were no more cancer cases in the New England States among people between the ages of 40 and 45, or 45 and 50, than there are among similar groups in the great Western frontier states, where, however, the population on the average is young.

These are some of the sources of error which have led physicians to erroneous conclusions—for example, that the Hindus who eat rice never have cancer. As a matter of fact, now that modern hospitals exist in India in which there is opportunity for care and the chance to study the incidence of cancer, it has been found that between the meat eaters in India and the vegetarians the cancer death rate does not differ. In one book it has been said that cancer is rare in China, based upon the report of some old explorer, while the recent missionary physicians who have gone to China will tell you that if you want to see cancer in all its phases there is no place where tumors are more remarkable and abundant than this.

CHAPTER III

WHAT IS CANCER?

Classification of Cancer

THE word "cancer," as popularly used, is a general name for a great variety of malignant tumors—malignant meaning that they ultimately destroy life by their growth. The word "tumor" is used for any lump or new growth in the body, which may or may not be malignant. There are many varieties of harmless or benign tumors and also many varieties of malignant tumors. The most recent book on the subject describes twenty-two main classes, each class being subdivided into various groups.

Benign tumors are not especially considered in this book. They rarely cause the death of those who carry them but merely bring discomfort or disfigurement. If sufficiently annoying, they can be removed surgically. The benign tumors are composed of either bone, cartilage, fat, muscle, or fibrous tissue. They differ from cancer not only in their origin but also in their course, growing usually to a limited size and not spreading to other portions of the body as does cancer.

Nature of Cancer

Malignant tumors vary greatly in their appearance, structure, and rate of growth. They have, however, one constant quality, they do not cease growing until they destroy the life of the patient.

In a few instances, probably not more than three hundred in the last twenty years, physicians have reported that a malignant tumor has ceased to grow or has apparently disappeared, leaving the patient in good health. But doubt has been cast upon the correctness of the records of many of these cases, and in the meantime millions of people have died of cancer which *did* progress.

Death from cancer may be very rapid, sometimes a matter of a few months if the tumor spreads quickly; or a patient may carry a small, local tumor, usually of the skin, for twenty years or more and even die of some other disease. Death is not caused by a "poison" from the cancer. There is no such poison. It is caused by interference with the proper functions of one or more of the organs of the body.

Sometimes, if the cancer ulcerates, the resulting infection may kill the patient. Pneumonia is a frequent cause of death in the late stages. But the astonishing thing is that in very rare instances a patient may have cancer growing in all parts of the body and still have a good color and not lose weight until shortly before death. This shows only that no vital function happens to be interfered with by the growth.

Diagnosis of Cancer

The diagnosis of cancer depends chiefly upon the discovery of a growth somewhere in the body. Such a growth may be due to inflammation, may be a benign tumor, or may be a cancer. Long experience is necessary to determine which of these things the lump is. Sometimes it is absolutely necessary to take out a small piece and examine it under the microscope before a final diagnosis can be made.

Internal cancers can sometimes be felt or seen in X-ray pictures. Their only other characteristics are

those of a growing mass in some place where such growths ought not to be. The symptoms which such internal cancers give are not due to the cancer itself so much as to interference with the function of the organ in which it is situated. It is obvious that the diagnosis of such internal cancers is extremely difficult and sometimes impossible.

As cancer is part of the body it does not cause any changes in the blood, except such as are due to interference with nutrition. Anemia is therefore a frequent symptom of cancer. But there are no blood tests, of the sort which are so useful in the diagnosis of infectious diseases like typhoid or syphilis, which reveal the presence of cancer.

Further details as to diagnosis will be found in Chapter V on varieties and symptoms of cancer.

Origin of Cancer

Cancer is divided into two main groups called by physicians "carcinoma" and "sarcoma." These groups are then subdivided into many others which are recognizable only by the expert and therefore need not be considered here. Carcinoma is some ten times as frequent as sarcoma. The various kinds of cancer differ in their appearance, their methods of growth, and in their causation.

In order to explain the nature of cancer it will be necessary to describe some of the normal structures of the body. As every one nowadays knows, our bodies are made up of cells. These are minute particles of various shapes and structure so small that they can be seen only under the microscope. Great masses of these cells collected together form the organs of the body. For example, the brain, liver, kidneys, heart, lungs, etc., are made up of different kinds of cells which form regular tissues and can be recognized as such under the microscope.

The first minute cell or ovum divides and redivides, thus forming different kinds of cells which grow and develop special characteristics, and finally arrange themselves as the organs of the body. When the child is born all the billions of cells which compose the body are ready to perform the mysterious functions which are necessary to continue the life of the individual. So special is the development of some of them that they would hardly be recognized unless we knew their origin. For instance, it is difficult to think of the teeth or hair as being derived from the skin, yet both these structures are made up of cells modified from those which go to form the protecting surface of our bodies.

In the healthy body all these cells remain throughout life where they were originally deposited, with the exception of the blood corpuscles which circulate around in the vessels to carry oxygen and food, to remove waste products, or to fight germs. The others stay strictly within the boundaries of the region in which they were originally deposited and there carry on the work for which they were predetermined. So long as they stay in place and at work, the body remains perfectly healthy. When the cells stray from their normal boundaries and grow throughout the other tissues we have a cancer. The causes underlying the escape of the cells are but vaguely known. Enough has been learned by experiments on animals and study of human tumors, however, to show that the chief cause of the setting free of these cells from their normal restraints is chronic inflammation.

Now inflammation is essentially merely the killing of a certain number of cells and their replacement by other cells. If a small, clean cut is made through the skin, hundreds of thousands of cells die from the injury, but immediately others begin to grow to replace those which have died. Thus, the space in the

deeper tissues is filled up and then the surface-covering cells, called the epithelium, finally grow over the cut to form a new skin and thus heal the injury.

When a bone is broken, blood is poured out at a point where the fracture has occurred, new bone and cartilage grows from the bone membranes, and a large block of bony tissue, called a callus, forms at the spot of the fracture. As time goes on the excess of this callus, which is larger than is necessary for a merely reparative job, is absorbed, until finally no trace of the fracture may be found. This is what we call normal repair.

When, however, the skin of a man or an animal is irritated for a long time by coal-tar, for example, which causes the destruction of the cells, there is replacement of the cells killed by the poisonous action of the tar. But if these replaced cells are then again destroyed by the tar and replaced, and such irritation is continued for a long period, some of the cells may escape into the deeper tissues and instead of a harmless reparative process we have the development of a cancer.

Such tar cancers, cited here as examples, are occasionally seen in human beings and are easily produced in some animals. The process is slow, however, requiring a good many years of irritation in man or a corresponding period of months in the shorter lived animals.

The intimate nature of these changes which occur when repair ceases and the cells begin to run away we do not yet know. Apparently the cells of a cancer are not very different from the cells of the healthy tissues except in their ability to grow freely, and it is often impossible to tell the beginnings of a cancer except by microscopic examination of the diseased tissue. Such study reveals the fact that the cells have grown down from the skin to places

where normal cells never penetrate. We then know that we are watching the beginning of a cancer. That some change must have taken place in these cells tho they may look like healthy ones, is shown by the fact that if we transplant healthy skin into the deeper tissues either in man or animal such healthy skin is quickly destroyed by the tissues of the body and no cancer is produced.

Apparently there has to be a long preparatory period of inflammatory growth in order that this cancerous change in the cells may take place. Nevertheless the cancer cell is so little changed that the body not only does not recognize it as a foreign creature but welcomes it and feeds it with its best. That its nature is but little changed may be seen when a particle from a cancer of the liver escapes from the main growth and is carried to a man's brain (metastasizes is the technical word) and there forms a miniature liver which secretes bile and ferments just as if it were a normal liver.

A single blow or injury never causes cancer so far as we know, because following such injury normal repair occurs. Broken bones, cuts, scratches or blows, such as an average child receives in plenty never result in the production of a cancer.

Contributory Causes Of Cancer

But in addition to chronic inflammation, it has long been known that there are other conditions which must exist in order that a cancer may arise. Some people seem more susceptible to chronic irritation than others, and they possibly have an hereditary susceptibility to cancer, a question which will be dealt with later in the section on heredity.

Not every one who works in tar, for instance, gets the chronic irritation which always precedes the

appearance of cancer and not every one who develops the skin trouble which follows such irritation gets a cancer. Furthermore, some people can continue almost indefinitely working with this substance and suffer no injury. Again cancer is easily produced in mice by tar-painting but not in guinea-pigs. Thus, tar can not be considered as the first cause of cancer, otherwise everybody using it would get the disease. It is merely a contributory cause, effective when other conditions are fulfilled.

IRRITATION

Beside the concrete example of irritation produced by tar leading to the formation of cancer, there are many other irritants which have also been found to be effective in this regard. Many parasites have been found to cause cancer in human beings; for example, in Egypt the egg of the worm *Bilharzia* is found in the bladder and the rectum, and cancer is sometimes found in these regions produced by the irritation of the pointed eggs of the worm. Workers in anilin factories have been found to have a greatly increased frequency of cancer of the bladder. A hill tribe in the Kashmir wear small baskets containing an earthenware jar in which lighted charcoal is kept. Burns which result from this practise not infrequently develop cancer. There are also many reported instances of cancer due to a variety of burns either from lye, acid, or hot water. When the Roentgen rays act on the skin for a long period a chronic inflammation is produced which may be followed by cancer, but only after a period of six or eight years have elapsed since the skin inflammation developed. That is, the X-ray itself does not cause cancer, but gives rise to a chronic inflammation which may give rise to cancer. Radium will do the

same thing. Fibiger of Copenhagen has been able to produce cancer of the stomach in rats by feeding them with a parasitic worm which burrows into the mucous membrane of that organ and sets up a slow irritation. Bullock and Curtis, of the Institute of Cancer Research of Columbia University, by infesting the liver of rats with a parasite, have been able to produce a large series of sarcomata of the liver, now numbering nearly a thousand examples. Cancers of the liver have also been seen in man, especially in Japan and China, due to the presence of a certain parasite.

Many more examples of such irritation-cancer could be cited but do not concern us here. Those given amply demonstrate that a chronic irritation may give rise to cancer in suitable subjects, other conditions, however, such as age and possibly a special susceptibility being necessary.

The causation of many human tumors, however, is much more obscure, because the chronic inflammatory process which precedes these growths is not so evident as in the examples just cited. For instance, there is no question but that an ulcer of the stomach may be followed by cancer if this ulcer remains unhealed for a long period in a person around the age of 45, but whether all cancers of the stomach are produced by ulceration as the primary factor is by no means certain. However, small ulcerated areas may occur in the stomach without giving symptoms, and it is quite possible that cancers may arise in these.

Tumors of the breast in women are almost always preceded by chronic inflammation of the gland structures of that organ, as may be demonstrated microscopically when the breast is removed by operation. More than a third of the tumors of the lower bowel are preceded by chronic inflammatory changes con-

nected with a condition known as chronic diverticulitis. Tumors of the skin and face are particularly common in farmers and seamen, who are exposed to the vicissitudes of the weather.

AGE

One of the factors which predisposes to cancer is age. If a large number of cases of cancer is studied, sufficiently large to eliminate those accidental fluctuations which occur in all records of this type, it will be found that the occurrence of cancer is rather sharply limited to people of middle or old age. Very few cases occur before the age of 40. After this period cancer becomes more and more frequent as age goes on. But age is not the only factor, for not every old person has a cancer.

RACE

Race seems also to have some part, for cancer of the skin, for example, is common in the white and rare in the brown or negro races.

CONGENITAL DEFECTS

Some very rare tumors in man seem to have a special origin. Most of these appear in early childhood and are formed of a great variety of tissue. For example, tumors of the kidneys are occasionally seen in very young children in which there is a mixture of kidney substance, nerve tissue, cartilage and muscle fiber. This implies that during the formation of the body the tissues, instead of taking their normal regular places assigned for each of them, have in some way been displaced, and having no definite function to perform, turn into a cancer. Such highly complex tumors have also been found in other parts

of the body, the only explanation for them being that they are remnants of cells or groups of cells left during fetal development of the child in the womb. Why these cells change into cancer is not yet fully understood. Thus, while chronic irritation or chronic inflammation of some sort is usually considered to be an antecedent or preparatory condition to the appearance of cancer, there are some tumors for which this explanation can not be brought forward, but it is very certain that in most human tumors an irritation factor is present.

HEREDITY

While tissue and organ defects may be inherited, the disease cancer, as such, is not. In the United States, in 1920, there were, for example, only 289 deaths from cancer in children under the age of five years, while the total recorded number was 72,931. If cancer itself were hereditary, it might be expected that the children of cancerous parents would be born with the disease.

Whether the *liability* to develop cancer is inherited is quite another question. Definite proof does not exist that such inheritance is possible in man, yet there are many experimental observations on animals and some statistical studies which suggest that it may occur.

The results of breeding special types of domestic animals have long since proved that certain gross structural abnormalities are inherited, and at present we know of a good many such defects which are transmissible in human beings.

If, however, this factor is an important one in man, we would expect a large number of families in which cancer was extremely frequent, and other families in which it did not occur at all. But as a matter of observation, cancer families are extremely rare, and

the records of those which have been published are not as accurate as is desirable for so important a decision, because the diagnosis of cancer is difficult and there is no certainty that the deaths in the earlier generations were really cancer.

The insurance companies have studied the question with care and find from their observations that the presence of cancer in one or both the parents does not increase the liability to cancer in their descendants, at least as far as regards that portion of the population which is insured.

At present, therefore, the conclusion is warranted that there is no definite basis for the belief that the heredity factor in man plays a very large part in the production of cancer as it occurs in the human race.

SEX

Sex also plays a part, many more women having cancer than men. But this is chiefly because cancer of the womb occurs only in women; cancer of the breast is a hundred times as frequent in women as in men. Cancer of the stomach is a little less frequent in women than it is in men; that of the gall-bladder four times more frequent in women. Cancer of the lip, tongue, and mouth is much more common in men than in women. This is probably due more to habits and social customs than anything else. Men smoke more than women and are less apt to keep their mouths clean and their teeth in good order. When women subject their mouths to sufficient irritation they also have cancer. For example, in the East Indies, women who chew an irritating substance known as the betel-nut and retain it in their mouths during sleep frequently develop cancer at the point where the masticated nut is kept.

CONTAGION

A hundred years ago it was thought that cancer was contagious, but recently it has been definitely shown that no such thing as contagion occurs. In fact, it is almost impossible to transfer a cancer from one person to another. No case has been recorded of a surgeon operating on a cancer where the growth was transplanted to a cut in his hand, nor is there any record of a nurse getting the disease from a patient whom she attended.

There is also no evidence that cancer is due to a germ, for altho germs can be found in cancer, just as they can always be found in the skin, yet when these germs are cultivated and injected back into the body they do not cause cancer. Hence they are merely present without playing any part in the causation of the disease.

As cancer is not contagious nor due to a germ, there is no reason to believe the stories so often told of cancer villages, cancer districts, or cancer houses. The appearance of a large number of cases of cancer in a single house has been often shown to be due to the fact that such a house had been occupied for years by a series of old people. As cancer is a disease more frequent in advanced age, there will obviously be more cases of the disease in such a house than in one which has been occupied by young persons.

The so-called cancer villages will usually be found to be small country towns from which most of the young people have emigrated elsewhere in order to obtain work while the old folks have remained at home.

There has been much newspaper talk about germs producing cancers in plants, but these plant cancers are quite different from the human disease. It has

also been suggested that human cancer comes from eating these plant cancers, all of which is plain rubbish. From time to time the statement appears, that the eating of uncooked vegetables which have been manured is the cause of cancer. This is also rubbish.

CHAPTER IV

EXPERIMENTAL STUDY OF CANCER

MUCH concerning cancer has been learned through the study of the human patient, both individually and statistically, but there are certain aspects of the problem which can be solved only by the use of experimental methods. This necessitates the employment of animals, in certain species of which cancer can be readily transplanted by grafting or produced by artificial means. Examples of only a few of the results obtained by such experimental work can be described here.

One important discovery was that by gently massaging a tumor it could be distributed all about the body of the animal, thus showing that any rubbing of a human tumor is extremely dangerous. Other experiments have shown that the cutting into a tumor in an animal and the removing of a small piece does not distribute the tumor about the body. This is important, for it shows that it is permissible to cut into a human tumor in order to determine its nature. This is sometimes necessary in order to avoid a mutilating operation in cases where the malignant nature of a growth can not otherwise be diagnosed.

Another important result obtained by the use of animal tumors has been the establishment of the necessary dose of X-ray or radium that is required to kill all the cells of a cancer, thus giving an idea of the amount of these agents which must be employed in human beings to destroy the whole growth.

Using animal tumors, a large number of tests of various suggested remedies for cancer have been checked and found, unfortunately, to be of no value. Many thousands of drugs, chemicals, dyes, vegetable extracts, and serums have been tested in this fashion, and all without exception have been found to be worthless.

Carefully conducted experiments on animals have shown that diet, also, does not influence tumor growth.

It has been found, further, that injecting or painting the skin of certain animals with tar will produce a cancer. Thus, it is possible to observe the changes which take place during the irritation of the skin before the cancer begins, and to study the very earliest stages of the growth, a matter which is helpful in the diagnosis of very early human tumors.

Breeding experiments with animals possessing cancer have shown that the susceptibility to the development of cancer is hereditary, but that tumors do not appear unless the conditions necessary for cancer, such as age and irritation, are also present. That is, the mere susceptibility to cancer does not necessarily make the animal have cancer.

Many other experiments have lead to interesting and valuable results which are applicable to human beings, tho it must always be kept in mind that facts derived from such experiments in animals can not always be wholly and directly applied to human beings. They are very suggestive and often of the greatest value in planning various studies on human cancer. Inasmuch, however, as tuberculosis in guinea-pigs, pneumonia in rabbits, and anthrax in dogs are entirely different diseases from those due to such bacteria in man, it is probable that mouse, rat, and rabbit cancer also differ somewhat from the cancers found in human beings. Since we can not

experiment on human beings, however, the only way in which progress can be made in the understanding of the true nature of cancer is through such animal experiments, which may some day bring a final solution of the great problem in the form of a cancer cure.

CHAPTER V

THE VARIETIES OF CANCER, THEIR SYMPTOMS AND DIAGNOSIS

AS the diagnosis of superficial cancer is not always easy, and that of internal growths except in the last stages often impossible for even the most expert physician, no layman need expect to be able to make a diagnosis of cancer. What he should and can do is to keep watch for anything which resembles a tumor as described in this chapter and then immediately consult a physician to find out whether it is a cancer or not. It may prove not to be one. for only about one-tenth of those who visited cancer clinics in response to the "Cancer Week" publicity during the last two years had cancer, the rest had lumps or ulcers of various types, which in most instances proved to be relatively harmless.

But people should not be ashamed of having consulted a physician in the belief that they have cancer only to be told that they have not. On the contrary, they are to be congratulated on not having so serious a disease.

In the diagnosis of cancer, certain general principles may be laid down. In the first place, as the disease is extremely infrequent under the age of forty, the likelihood of cancer occurring in a young individual is slight. In 1920 in the United States Registration Area 4,739 people under forty are recorded as having died of carcinoma and 1,220 of sarcoma, making a total of 5,959, leaving 66,972

dying after that age. Thus, after forty, cancer becomes ten times as frequent as before that period, and the liability increases with advancing age. Cancer of certain organs, for example, of the rectum, breast, and womb, is relatively more frequent in younger persons between forty and fifty, while cancer of the skin is usually seen late in life.

Those in certain trades and occupations should be especially cautious, for in them cancer is more frequent. Chimney-sweeps in England up to 1910 still had the highest death-rate from cancer, sharing this undesirable position with seamen and brewers, while the lowest rate in 1902 was that of clergymen, about a third of that of the chimney-sweep, and a half of that of the brewers and sailors. But by the year 1912, the chimney-sweeps had fallen from their high estate in the cancer world, and the rate, while much below that of the brewers and bar-keepers, and about that of the general laborer, is still twice as high as the lowest group of the population—the clergymen. Evidently the chimney-sweeps are improving in personal cleanliness, with resulting elimination of irritation from soot, for, as has been long known, the chimney-sweep's cancer is due to the irritating effect of this substance. Seamen and farmers are exposed to the weather and hence frequently develop cancer of the skin. Brewers and bar-keepers have a high rate of cancer of the stomach and liver, probably due to the excessive consumption of alcohol, to which they have ready access.

While every one is subject to cancer, those engaged in physical labor seem to be more liable to this disease than the other classes. This is probably because of the greater opportunity for irritation and injury which lead to slow healing sores. Further details concerning these occupational irritations are

given in the chapter on the causation and prevention of cancer, and need not be repeated here.

Little can be said of the general symptoms which may be expected to indicate the presence of a cancer. The healthy and the feeble are attacked with equal frequency. Pain is always a late symptom, due to the involvement of the nerve filaments by the tumor and not specifically due to the growth itself. Anemia is also a late symptom pointing to involvement of the bone marrow by metastasis, by which expression is meant the transfer of tumor particles to remote portions of the body through the lymph and blood stream, thus giving rise to secondary growths. The symptoms depend very greatly upon the type and situation of the cancer. If, for example, the growth occurs in the breast, it may reach a large size without causing any disturbance in the bodily health. Cancer of the spleen, of the kidney, and liver, or even of the lung may reach a considerable size without causing any symptoms. On the other hand, a very small cancer of the stomach will cause distress because it interferes with the passage of the food to the bowel. In cancer of the brain also the symptoms depend almost entirely upon the portion of the brain involved by the tumor or those parts which are pressed upon by the growth as it expands within the rigid cavity of the skull. Some portions of the brain may be occupied by a tumor for a long period without a symptom, in other portions a minute tumor no larger than a bean may cause death by pressure on a vital part of the nervous system. Usually tumors of the spinal cord are small because they produce paralysis, usually of the lower limbs, and thus are diagnosed early.

We will now consider the special symptoms of the most frequent types of cancer.

Cancer Of The Skin

Cancer occurring in the skin is known by a special name, "epithelioma," and is of two varieties. Cancers which occur on the face above the level of a line drawn through the upper lip to the lobe of the ear are generally of the basal-cell variety and are often very slow growing and not extremely dangerous. They do not give off particles to other parts of the body and unless neglected, rarely cause death. Such tumors are easily cured by radium, by X-ray, or by cutting out, or in many instances by the use of caustics. No one should ever die of this type of tumor, because in its early stages it is always curable. This form of skin tumor usually develops after fifty and is increasingly frequent as age progresses. It begins as a small, round or flat-topped slightly raised area, which may increase in size very slowly and is yellowish or brownish in color. After a time a scab may form. This scab is easily pulled off by slight rubbing and the underlying tissue may bleed. A new scab will form, and is again knocked off. Finally, instead of a scab, a little hollow, bare, area with raised edges will form which is an ulcer. This ulcerated tumor may heal up for a time and then break down again. Anything of this sort on the face indicates that a person should immediately go to some competent physician and have the growth properly treated. The smaller it is, the easier the final cure. The most dangerous place for a tumor of this sort is on the eyelid, where unless the tumor is taken very early it necessitates a difficult operation or even the removal of the eye. Hence it is usual to treat these tumors with radium or X-ray. But if a cure is not promptly obtained, surgery should be resorted to. Another frequent spot is on the side of the nose where glasses rest, or at the

lower end in the groove between the nose and cheek. Here very prompt treatment is needed, because if the growth gets into the cartilage of the nose it is very difficult to cure by radium or X-ray, and may have to be cut out. It is difficult to avoid bad scarring from such an operation.

Skin tumors occurring on the face below the level of the nose or on the skin of the body elsewhere are usually of another type, called the squamous-cell epithelioma, and are much more dangerous to life than the basal-cell form. The squamous-cell variety may also occur on the upper portion of the face, on the scalp, or on the neck, and are dangerous tumors from the start. They should not be treated by radium or X-ray, but should be cut out immediately because it is very difficult to cure them by these means, and the scarring is often worse than that resulting from surgical treatment. Under no circumstances should caustics be applied to this type of tumor. This variety begins as a warty patch or a crusted area like the basal cell, but ulcerates early and also promptly gives off particles which swim about in the blood or lymph vessels and form new centers for tumor growth.

A small proportion of the cancers of the skin occur under the hair (about one in twenty), and it is very important that any warty or ulcerated growth on the scalp be promptly attended to. They are very much more common in the old, and as they are likely to be concealed by the hair, especially in women, they may grow to a considerable size before they are noticed. Their chief danger is that they grow very quickly through the scalp into the bone, and are then incurable. Most of the large tumors seen on the scalp in old people, however, are not cancers at all, but wens, which are cysts containing fatty material. These are in general perfectly harmless, but some-

times cancer arises in them, and they should be removed if any evidence of growth is noticed.

A dangerous variety of skin cancer occurs in workers in brass foundries and machine shops. It appears on the hands or forearms and is probably due to oil or metallic irritants with which the skin becomes soiled. Any scaly or rough patches which do not heal over with simple ointment or other treatment within a short time in a person over the age of fifty should be promptly shown to a doctor.

There is no type of growth which gives clearer evidence of the relationship between irritation and tumor production than does cancer of the skin. Moles may be irritated and become cancerous during the use of electric or caustic treatment by those who pose as beauty specialists. Have the tumor cleanly cut or leave it alone.

Cancer Of The Lip

Cancer of the lip occurs far more frequently in men than in women. It almost always appears on the lower lip, malignant disease of the upper being infrequent. Lip cancers have been seen in young boys not over fifteen years of age; but usually they are rare under the age of thirty-five, and then only when irritation has existed for a long time.

The most common form of such irritation is from a rough or hot pipe-stem, hot cigar or cigaret smoke, or from the practise some men have of sticking a cigaret to the lip while smoking. When this practise is persisted in for a long time a rough area appears which is slightly elevated or flat. It is redder than the rest of the lip and bleeds a little. At first it is soft, but later feels as if under the thin skin of the lip there is a small cake of wax, which can be taken between the fingers. Or the tumor may

begin as a small painless spot like a cold sore which, however, does not heal quickly. If ointments or other simple applications do not result in prompt healing within a couple of weeks the question of cutting out the tumor should be seriously taken up. If not cared for a scab forms over the area, falling off from time to time, leaving a fresh raw spot. Gradually this becomes larger, the tissue about it harder and bleeding is not uncommon. If allowed to continue without treatment, the cancer eats its way into the lip and may form a large, ragged ulcer with hard edges. By this time, usually, lumps can be felt under the chin and in the side of the neck. These are extensions of the cancer down into the lymph glands. When this stage is reached treatment is extremely difficult, while if it is cut out in the early stages a very large proportion never return. The best treatment therefore is removal of the tumor and its extensions by a competent surgeon.

Yet over 6,000 people died of this disease in 1920 in the United States and these figures probably represent only a portion of those who refused to avail themselves of modern methods of treatment.

Cancer Of The Tongue

Cancer of the tongue killed about one per cent. of those who died from cancer during the year 1920 in the United States. The vast majority were men, cancer of the tongue occurring in women with great rarity.

The disease is frequently preceded by a whitish thickening of the tongue which may remain for a good many years before it changes into cancer. It is most often seen in those who have had syphilis, and who also smoke a very great deal. Persons with this trouble should have a physician watch them

carefully, and examine the tongue at least once a year for any beginning ulceration or excessive thickening of the white area.

Many cases of cancer, however, develop without this precancerous condition. A small ulcer, often treated with contempt only, appears on the edge or tip or near the base of the tongue and may be due at first to the repeated biting of the tongue during the chewing of food, or it may result from continued friction of a jagged tooth, or ill-fitting or sharp edged dental plates. Those most competent to judge believe that cancer of the tongue is a disease of people who do not keep their mouths clean, such uncleanliness preventing the healing of simple ulcers. After the above mentioned area has remained unhealed for a month or so, it gradually spreads in size and becomes thicker and harder and extends more deeply into the tongue. The raw surface is often covered with a yellowish coating. Gradually the tumor penetrates into the substance of the tongue which then becomes stiff and interferes with speech. Finally a large part of the tongue may be involved, and often a deep crater-like opening extends into the tissue from the surface. In this stage it is past all hope of cure. In the first stage pain is usually absent; in later stages, common; the odor of the breath is very offensive and saliva flows freely, the glands in the neck begin to swell and finally reach a very large size. The tongue is an unfavorable site for the cure of cancer, because people refuse operation at an early stage when it is amenable to treatment, preferring to wait to see what happens. When the wait-and-see period is past the growth is usually beyond any cure. Tongue cancer is a condition in which haste in diagnosis and speed in treatment is absolutely necessary, and is one of the sites where it is justifiable to take out a small fragment to make

a microscopic diagnosis and protect the patient. It is quite possible in the early stages to remove the tumor and a sufficiency of the surrounding tissue with it to produce a cure, without the patient's speech being interfered with nor the tongue greatly mutilated. In the later stages so much has to be removed that the victim is unable to speak clearly and has difficulty in the chewing and swallowing of food. X-ray is useless and radium applied to the substance of the tongue in the form of needles may produce temporary relief, but not a cure.

Cancer Of The Mouth And Gums

Cancer of the inner surface of the cheek and the floor of the mouth resembles cancer of the tongue in all appearances, but it is far harder to remove successfully because of the difficulty of getting beyond the diseased tissue. Cancer of the gums is not infrequent. There are two types of tumor which can occur here. One form, often seen about the roots of diseased teeth or in a cavity from which the tooth has been removed, is known as a giant-cell sarcoma or epulis. It is easily curable. An epulis looks like a reddish mass of proud flesh; it frequently bleeds freely and small pieces can easily be picked off. All that is necessary is to remove the tumor thoroughly, and in a large majority of the cases no return ever takes place. The other type of cancer, the epithelioma, is far more dangerous; it forms hard, projecting, or ulcerating areas on the gum, on the inside or the outside of the line of the teeth, or sometimes in an area where the teeth have been removed. Ill-fitting plates are often responsible for the trouble. When such epitheliomata occur on the roof of the mouth they may become ulcerated or grow as large, warty, cauliflower-like masses. The

latter are perhaps a little less dangerous than the ulcerated type and can often be removed very satisfactorily, but they should never be neglected if it is possible to treat them in their early stages. Smooth, rounded, hard, bony tumors form on the borders of the jaws and on the roof of the mouth and are quite harmless, but should be shown to a competent surgeon in order that they may be removed if necessary.

Cancer Of The Nose And Throat

A great variety of cancers appears in the nose, or the sinuses communicating with the nose, or in the upper part of the throat. Such cancers are always extremely serious. The causes are unknown and usually their symptoms are very obscure.

The first thing noticed as a rule is swelling which interferes with the passage of air through the affected sides of the nose with increased discharge of mucus and sometimes blood. Neuralgic pain in the nerves of the face is common; headache, loss of appetite, and, in the later stages, anemia and loss of weight may occur. Very frequently these symptoms appear only one at a time, and the patient and even the physician may be deceived into thinking that there is some inflammation of the sinuses of the face. Frequent bleeding from the nose or mouth, especially accompanied by change in the voice, suggests the possibility of a tumor of the back of the throat. A definite diagnosis requires more experience than is possessed by the average practitioner and as soon as the symptoms are noticed a throat specialist should be consulted, if possible, so that all of the modern methods of illuminating the pharynx and the sinuses and also the examination of X-ray pictures may be done by an expert. All of the symptoms, it will be noticed, are not characteristic of cancer, but

may also be due solely to inflammatory conditions in the nose and the pharynx.

Cancer Of The Tonsil

Cancer of the tonsils also appears without symptoms. No pain or any other phenomenon may be noted except the appearance of a swelling in the throat. Later pain and difficulty in swallowing are evident. Sometimes the swelling is simply due to inflammation, but if it persists, especially if the surface of the tonsil becomes ragged and irregular, expert advice should be obtained. Swelling of the tonsil is not infrequent in some types of blood disease, known as leukemia, which is unfortunately absolutely incurable.

A special form of cancer known as lymphosarcoma occurs in the tonsil, but is rarely limited to this region, and when present in other parts of the body is inevitably fatal after a longer or shorter period. This type of tumor is best treated by X-ray. The epithelioma type of cancer of the tonsil should be cut out if possible, but a partial operation is worse than none at all. Cures are extremely rare and some surgeons are recommending that no attempt be made to cut the growth out, but that the patient be given the relief which is obtained from radium.

Cancer Of The Larynx

The relative frequency of cancer of the larynx is not very high, forming about 0.7 per cent. of all cases of carcinoma. It is very rare in young people, most of the cases occurring between the ages of forty and seventy. It is three times as common in men as in women. Its causation is uncertain, but the chronic laryngitis resulting from excessive smoking or straining the voice in public speaking may have something

to do with the occurrence of the disease; but these factors are not present in all cases.

The first symptoms are a change in the quality of the voice, roughness and hoarseness and difficulty in speaking, with a sense of discomfort in the throat and occasionally a slight cough. Pain is usually not present, but if noticed is sharp and shooting in character and is felt in the larynx itself. Some or all of these symptoms may accompany a warty condition of the vocal cords, which is not cancer but can not always be differentiated without microscopic examination of an excised fragment. Finally, in true cancer, complete loss of voice occurs, with difficulty and pain in swallowing, due to pressure on the gullet from the extensions of the cancer involving the surrounding muscles and glands of the neck. In this stage no treatment is of any avail. Radium and X-ray are dangerous, for if large doses are given, the lining membrane of the larynx may swell and the patient be suffocated unless the throat is promptly opened. When recognized very early, and usually such recognition implies the diagnostic skill of a specialist, and the disease is confined to a small portion of the larynx, it is possible to remove the tumor with permanent benefit and yet not sacrifice the patient's ability to talk. More advanced cases require expert judgment to decide whether the whole larynx should be excised or whether an operation can be done from the inside. So many questions arise concerning the ability of the patient to continue his work without the capacity for speech that the proper treatment of cancer of the larynx may be one of the most delicate and painful decisions which a physician is called upon to make for his patient.

Cancer Of The Breast

Over 8,000 deaths in the United States occur

yearly from cancer of the breast, of which 99 per cent. are in women, and 1 per cent. in men. A large proportion of these deaths is needless and preventable. This type of cancer occurs fairly frequently in the age groups below forty-five.

The important symptom is a lump or thickening anywhere in the breast. Such a lump or thickening is by no means necessarily a cancer, in fact, is frequently not a cancer, but when discovered, should be promptly examined by a competent surgeon. Occasionally when the tumor is near the nipple, there will be a bloody discharge from that orifice. If the tumor is near the surface of the breast, a dimpling or drawing in of the skin is commonly seen in cancer, but is not necessarily a proof of this disease, as it may occur with benign tumors.

The reason why all of the breast tumors should be promptly examined is that many of the cases of cancer originate in old inflammatory areas, which have persisted for a good many years before a malignant change takes place. It is important therefore to have the tumor examined; its hardness estimated, and its shape and dimensions *measured* and *recorded*. Then, some three to six months later, if there is no evidence of growth, the patient may rest assured that the process is not active. If there is any swelling of the glands under the arm or in the neck, it suggests that the cancer may have spread to this portion of the body. The condition is not yet hopeless, because surgical removal of the breast and of the glands under the arm not infrequently produces a permanent cure. However, it must be remembered that swollen glands under the arm are not necessarily an evidence of cancer; the swollen glands may be due to tuberculosis or other types of inflammation and have nothing at all to do with cancer.

Cancer of the breast is practically never painful,

except in late stages when the nerve trunks are involved by the pressure of the growth; but one of the most common stories which a surgeon hears is that a woman has delayed coming, as the tumor was not painful. In young women the question of removal of a small tumor depends a great deal upon the site and nature of the growth. Very few of these are cancer and only a small proportion of them ever turn into cancer. After women reach the age of forty-five or fifty, the question is an entirely different one. Then it is wise to remove all lumps which are hard by a non-mutilating operation, because this is the age when the inflammatory or hyperplastic growths begin to turn over into cancer.

Records of the large hospitals show that cancer, when it has been operated upon at an early stage before the glands under the arm are involved, give at least 50 per cent. of permanent cures. When these glands are involved, the percentage falls to some 20 to 25. The publicity campaigns carried on by the Society for the Control of Cancer have done much to improve the conditions under which cancers of the breast are now operated upon; but there are still many women who appear much too late for successful surgery. This is not always their fault. They may have been advised by physicians who have not appreciated the dangers of the situation to delay until it was certain that the growth was cancer. But when it is "perfectly certain" that a breast tumor is cancerous, the condition has so far advanced as to render a permanent cure doubtful.

Cancer Of The Womb

In women cancer of the womb is, next to that of the stomach, the most frequent type of the disease.

In 1920, 9,848 cases were recorded in the Registration Area, or about 12,000 for the entire country.

Of two types, that of the cervix or neck of the womb attacks chiefly women who have borne children. The other form, involving the interior of the organ, is seen in both those who have borne children and those who have not; it is much less serious, as it is curable in a high percentage of the cases by surgery. Cervix cancer, the most frequent type, owing to its situation, early involves the bowel and bladder causing a great deal of physical suffering. It is therefore especially important that women learn to recognize the very obvious symptoms of this disease.

The first and most frequent symptom is blood or a blood-tinged watery discharge appearing between the periods. Such a symptom is quite sufficient evidence to warrant a woman consulting a specialist immediately. It is obvious that such bleeding may also be due to other conditions, as a fibroid tumor or irregularities of menstruation or the changes in flowing which occur at the beginning of the menopause. But the only way to settle the question is to have a careful physical examination with a direct ocular examination of the neck of the womb. If necessary, a small fragment of tissue should be removed for microscopic examination. This can often be done without an anesthetic.

In the later stages the discharge continues bloody but may become very offensive. Even if no blood is present, a malodorous discharge warrants an examination. Pain is a late symptom and may be referred to the bladder or the rectum or may radiate down the legs. This indicates invasion of the walls of the bladder or rectum or pressure on the nerves in the pelvic region and indicates, therefore, advanced and hopeless cancer.

While splendid results follow the treatment of early cases either by surgery or radiation, in general the treatment of cancer of the womb is, at the present time, in a very unsatisfactory condition because very few women come sufficiently early. Among the more intelligent classes we rarely find more than one cancer in ten of this type which is suitable for operation. Among women of the laboring class it is rare ever to see a case early enough to permit of an operative cure. In this dilemma the only recourse is radium or X-ray. Proper radiation treatment is peculiarly effective and there are now on record a number of inoperable cases which have gone from three to five years without return of the growth, following radiation treatment only.

Cancer Of The Stomach

The stomach is the seat of about half the cases of cancer occurring in men and one-third of the cases occurring in women. In 1920 in the United States 32,000 people died of this disease alone. Unfortunately it is one of the most difficult types of cancer to diagnosticate and to treat.

The only symptom may be a fairly rapid loss of weight in persons over fifty years of age. Pain after eating is unfortunately a symptom of ulcer, of dyspepsia of a certain type, and also of cancer. Blood in vomited material is likewise a symptom of cancer and ulcer as is also blood in the passages from the bowels. A chemical analysis of the secretion of the stomach may afford useful information, but it by no means enables us to make a certain diagnosis of cancer or to eliminate the possibility of cancer in any given individual. Belching of gas or vomiting large quantities of food is a late symptom of cancer, but also may occur in benign stricture of

the outlet of the stomach. When a tumor can be felt, the patient is usually beyond any possibility of cure. The careful study of X-ray pictures taken after the giving of a meal containing barium sulfate so as to cast a shadow of the cavity of the stomach, is also extremely valuable, but not necessarily decisive, for the pictures given by ulcer and cancer are somewhat similar. If the cancer is not ulcerated, the X-ray may give no aid in the diagnosis. As the symptoms are so vague and the disease so fatal, every person who has symptoms of indigestion or a slight loss of weight or slight anemia accompanying symptoms of indigestion or severe pain in the stomach before or after eating, should have a careful examination by a physician. And after the age of 40, if these symptoms persist, the stomach condition should be examined at least once a year, as cancer may arise on the base of an old ulcer or chronic inflammatory processes of the mucous membrane. When the diagnosis is suggestive it may be wise for the patient to have an exploratory operation in order to clear up the situation. If an ulcer is present, it should be excised in order to reduce the possibility of a cancer developing from it. If the cancer is small and in a suitable position, it can be removed with every possibility of a permanent cure. If it is in such a place, or is so large, that it can not be removed, then a short-circuiting operation often brings relief and prolongs the life of the patient in fair comfort, sometimes for a period of years. X-ray and radium in their present developments are of no value in the treatment of carcinoma of the stomach.

Cancer Of The Liver And Gall-bladder

Cancer of the liver and gall-bladder are usually

classed together in the Census Reports. They caused the death of about 10,000 persons in the United States in 1920. A large number of the cases recorded as cancer of the liver, however, are actually cancer of some other part of the body, with transplantation or metastasis to the liver. As the symptoms of the liver cancer are apt to predominate over those of the primary growth, a correct diagnosis is often impossible during life. Cancer of the liver is always incurable.

Cancer confined to the gall-bladder is a rarer form, causing the death of about 1,000 persons in the United States. It is usually so far advanced when discovered that it is incurable. The symptoms are often the same as those of gall-stones.

Gall-stones are related to the production of cancer, for they are frequently found with carcinoma of the gall-bladder. Therefore, as women have gall-stones much more frequently than men, cancer of the gall-bladder is nearly four times as frequent in females as in males.

Cancer Of The Intestine

This form of malignant disease is practically limited to the large intestine and fortunately is only about one-fifth as frequent as cancer of the stomach. It is a disease of advanced life. About one-third of the cancers of the large intestine occur in the lower portion, the rectum. The most frequent site is in that curved part of the lower bowel on the left side just above the rectum, called the sigmoid flexure. The disease occurs with about equal frequency in both sexes.

The symptoms differ somewhat, depending upon the portion of the bowel that is involved. In the large intestine the growth tends to form cylindrical

masses surrounding the gut or involving the wall, and often in consequence producing a narrowing of the channel. The patients may only notice at first that they are constipated or that they bloat easily after taking food. Cancer of the large intestine is occasionally recognized in patients who have no symptoms by the mere feeling of the abdomen, for the thickening of the gut wall forms a lump which can be felt. After a barium sulfate meal, the X-ray frequently reveals a narrowing or partial obstruction of the intestine due to the constriction by the tumor. Visible blood or mucus in the passages is rarely seen.

When the patient becomes thin and pale the disease is usually very far advanced and only a palliative operation can be done. In general, however, cancer of the bowel is a fairly favorable type, as symptoms are produced early by the constriction of the gut and the surgical removal is often fairly easy.

Cancer Of The Rectum

Cancer of the rectum is even more easily diagnosed, but frequently escapes recognition because the physician does not take sufficient pains to make a careful and thorough rectal examination. It is a form of cancer seen both early and late in life. Sometimes it occurs in young children. In this type of cancer, in contrast to that higher up in the intestine, the passage of blood and mucus is quite frequent, constipation is early in the disease, and pain is rather more frequent than in cancer elsewhere. Alternating constipation and diarrhea is one of the important signs.

Many cases may pass unrecognized because they are supposed to be merely piles, and a proper rectal examination is not made by the attending physician,

for many of the rectal cancers may be felt by inserting the finger into the bowel. Others are higher up and require the insertion of a tube so that the tumor can be seen. Total obstruction is rather late, as cancer of the rectum often involves only a part of the wall of the gut. X-ray pictures after a barium meal often give very valuable information.

If the growth can be removed it should be cut out by surgical methods. If too far advanced, the bowel may have to be opened above in order to permit free passage of the intestinal contents. After this operation, even if the growth can not be removed, life may be prolonged in some instances for six or seven years; for as soon as the tumor is relieved of the irritation of the passage of fecal matter over its surface, it quiets down and does not grow so rapidly. X-ray checks the growth somewhat, but there is no evidence that cures are obtainable with our present technique. If the growth is low down and inoperable, radium needles may be inserted into it after the bowel has been opened from above. This may cause a very great shrinkage of the growth, but probably no permanent cure.

Cancer Of The Bladder

Cancer of the bladder is fairly frequent, forming about 3 per cent. of the total cases of cancer in the United States, which means that at least 2,000 people die every year from cancer of this region. The disease is five times as frequent in men as it is in women and rarely occurs before the age of forty. Most of the patients are from sixty to seventy years of age.

Cancer of the bladder is an extremely difficult type of cancer to diagnose, because the tumor may reach a considerable size without giving any symptoms.

Blood in the urine is the most important sign and when this is noticed a physician should be immediately consulted. The mere presence of blood, however, does not of itself diagnose a cancer of the bladder. The blood may be due, among other things, to kidney disease, to a tumor of the kidney, or to a stone in the bladder. Modern methods of examination permit the insertion of an illuminated instrument into the bladder so that the tumor can be easily seen. In the later stages the urine becomes foul smelling, very cloudy, and filled with mucus, blood, and pus. Inflammation of the bladder not infrequently coexists, with severe pain and a feeling of bearing down or straining as urine is passed. Frequency of urination also occurs later.

There are types of tumor of the bladder called papilloma which are not highly malignant, or may even be benign, but cause many of the symptoms of cancer. The distinction can only be made by a careful examination with an instrument or, preferably, by examining a piece of the tumor under the microscope. These benign tumors are easily cured by electrical treatment without opening the bladder. Cancer can only be cured by removal of the tumor itself after opening the bladder. In early cases the results are good, one-fifth of the patients remaining permanently cured. Late cases are hopeless.

X-ray and radium often check the growth for a long time, stop the hemorrhage, relieve the pain, and put the patient into a very comfortable condition, but no guarantee of a cure can be made.

Cancer Of The Prostate

Cancer of the prostate which caused some 1,800 deaths in 1920, gives many of the symptoms of cancer of the bladder, but usually only in its later stages.

The growth can be felt as a hard mass projecting into the rectum, and the diagnosis is usually easily made in this simple manner if the patient is properly examined. The disease, however, is almost never seen in an operable stage. Palliation with X-ray may bring relief from all, or most, of the symptoms for a period of from one to three years.

Cancer Of The Kidney

Cancer of the kidney is, fortunately, a very rare disease, about 1,000 deaths occurring annually from this form. Its only symptoms are a lump in the abdomen and blood in the urine. Sometimes a shadow may be demonstrated by X-ray pictures. Pain is also very rare unless the tumor is large and presses on the surrounding tissues. Operation is the only possible cure and this fortunate result is but very rarely obtained.

Cancer Of The Bones

The bones are affected by a type of cancer known as sarcoma which differs from the carcinomata which occur in most of the other portions of the body. A number of types of sarcoma occur in the bone. Some of these are highly malignant; others are very much less dangerous.

The symptoms of sarcoma of the bone are very obscure. If it is on the outside of the bone it may produce a swelling which is painless, or painful if it stretches or presses on the nerves. It may grow very slowly or rapidly and finally may ulcerate through the skin. If it is inside the bone, the only symptom is pain until the tumor has been in existence for a considerable period of time. These patients are often thought to have rheumatism. Then it begins

to eat away the bone and the X-ray demonstrates extensive absorption of the hard bone. Sometimes the bone breaks spontaneously after very slight injury, and this may be the first symptom of a sarcoma.

Fortunately sarcoma of the bone is rare, only about 4,000 people dying of this disease in the United States in 1920, as compared with the large number of deaths from carcinoma.

CHAPTER VI

THE TREATMENT OF CANCER

THIS chapter is not intended to enable the patient or his family to determine the scope and method of treatment of any individual case of cancer. Such decision often needs the combined experience of the surgeon, radiologist, and pathologist in order to reach a proper conclusion, and hence is far beyond the ability of the layman. The intention is rather to show how many factors enter into such a decision, the difficulties and complexities of the problem even after a correct diagnosis has been made, and to indicate the necessity of obtaining the best medical opinion rather than a reliance upon home remedies or the advice of quacks.

The successful treatment of cancer implies a correct and early diagnosis followed by the total removal or destruction of the tumor and any metastatic deposits anywhere in the body. In practise this most desirable achievement is infrequent, because by the time the existence of a cancer is recognized by the patient, the growth has often extended so far that it is impossible to remove it completely.

Such complete removal can only be accomplished by either cutting out or destroying the tumor by chemical or physical methods. As might be expected from the nature of cancer, being merely a part of the body, no other method of treatment has been found to be effective. Until, therefore, some difference is found between the cancer cell and the normal cell, and as yet no such difference has been dis-

covered except the ability of the cancer cell to grow more freely than the body cell, there is no hope for the cure of cancer by medicine.

The cure of cancer implies, therefore, as has just been said, the physical or chemical destruction of the growth at its beginning. The easiest way to destroy it is to cut it out, either with a knife or a cautery, and such methods have produced and are continuing to produce large numbers of permanent cures of the disease. For cancer is not a blood disease, but is local in its beginnings, and is always curable if it can be diagnosed when it is very small and promptly removed.

Unfortunately, none of the internal cancers can be diagnosed early, and the external ones are usually allowed to go for a long period without care, owing to the ignorance of the public concerning the importance of the prompt treatment of every suspicious growth.

The exact way in which the operation is done, and its extent, must be determined by the surgeon and is often modified by conditions found during the operation itself. It is therefore impossible to make any general statement completely covering this method. Whether the cautery or knife be used is also a matter of judgment in which the layman need not concern himself.

The destruction of cancer by chemical means has been practised for many thousands of years and is still being used in the removal of small skin cancers. A number of caustic substances, the formula for which can be found in writings of the time of the Pharaohs, are still being employed. But, in general, such caustics are difficult to control and are apt to leave rather a bad scar, often far worse than does surgery, and their use is being more and more restricted with the development of improved methods

of treatment, such as radium and X-ray, which in time will no doubt entirely replace such chemical caustics.

The electric spark is also being used to destroy cancer tissue and is valuable in skilled hands, but, of course, is limited to accessible growths such as those of the skin or mouth. It can only dry up or char the tissues and does not destroy any deep-seated extension of the cancer. Its application is limited to small superficial growths, and if properly used in suitable cases, is very effective.

Radium and X-rays fall into an entirely different category. They are used in two ways: one to slow the growth of a tumor or prevent its return and thus prolong the life of a patient; the other to attempt the total destruction of the growth by their caustic effect. The first is a means of aiding surgery or of benefiting the patient when surgery is impracticable; the second is the attempt to replace surgery. Whether a sufficient number of cures are obtained at present to warrant the hope of their replacing surgery, is very doubtful. The weight of opinion among conservative students of the question is, that while radium and X-rays are extremely beneficial in many ways, there is no proof that, if all varieties of cancer are included, they offer any number of permanent cures as compared with surgery. The basal-cell epitheliomata and cancer of the womb may prove to be exceptions to this rule.

Each of these physical agents has some inherent advantages. The especial value of radium is that it can be placed in the diseased tissue by the insertion of small needle containers, thus utilizing its full destructive action. These needles contain varying doses of radium, usually small quantities. They can be placed close together in a tumor so that all the

intervening structures are thoroughly influenced by the radiation and in many instances destroyed.

The problem as yet unsolved is the destruction of the outlying portions of the tumor not connected with, or at a distance from, the main growth, without at the same time seriously damaging nearby healthy tissues. In other words, we meet the same condition that confronts the surgeon; if the tumor is already widely spread, radium will not effect a cure any more than surgery will.

Proper application of radium in this manner requires a good deal of surgical knowledge and manual dexterity, wide experience to avoid destruction of the healthy tissues, and a large amount of radium to produce the best effects. As radium is extremely expensive, this limits the treatment of tumors of any size to such institutions or individuals who possess these large quantities of radium. There are only a very few places in the United States at present where all these requisites obtain.

The X-rays are invisible light rays which have the power to penetrate substances which are opaque to ordinary light; they can therefore enter the body and destroy cells at any depth. Theoretically any cancer can be cured by X-rays, but practically the situation is vastly different, for the dosage necessary to kill the tumor is often so high that the normal tissues through which the rays have to pass to reach the growth may be seriously damaged, and even the death of the patient may result if an attempt is made to destroy the whole tumor. In inaccessible tumors, such as growths of the chest or abdomen, X-ray is better than radium because it can penetrate through the skin, muscles, and fat of the body and reach the tumor.

The application of X-rays is relatively simple, and great benefit is often seen following its use. Un-

fortunately, this happy result is rarely permanent, altho the patient may remain in good health for a number of years; but if the tumor is of a highly malignant variety, it sooner or later returns.

There is also another defect inherent both in radium and X-ray. If large doses of either of these physical agents are employed in treating cancer, for example of the stomach, the surrounding organs are invariably severely damaged.

The very remarkable development of radiation therapy with X-ray and radium has, however, added several new phases to the question of the treatment of cancer. Employed in combination with surgery, radiation may be used to destroy small portions of a tumor which can not for any reason be completely removed. Such palliative use, especially of X-ray, is now becoming very general. In certain types of tumor also, where these rays are especially effective and where the operative surgical mortality is high, there has begun to be a balancing of the two methods of treatment.

The radiotherapeutist may say to the patient: "I can not guarantee to cure this tumor, but I can promise you that without any risk to life, pain and other symptoms will disappear, and the growth of the tumor be arrested for a period of months or years. At the end of that time it may come back. The treatment is short and not especially painful."

The surgeon may argue on the other hand: "The surgical operation is dangerous. One-tenth of the people undergoing it die. Of the 90 per cent. of those who survive the operation, 25 per cent. are permanently cured. The other 75 per cent. ultimately die from a return of the disease, but often not for three or four years. During this time they may be in good health."

The facts of these two statements are equally valid

and the patient is put into a position where a decision may be extremely difficult. The answer may depend a great deal upon the responsibilities and economic situation of the patient who has to make the decision. In a laboring woman who has a cancer of the womb, for example, and a family of small children to support, the death of the mother would be a calamity and therefore she might elect to take her chances with radium treatment, hoping to get four or five years' relief from the tumor and remain in physical health during that time, rather than risk the danger of the operation and the improbability of a certain cure.

But there are some other factors which have to be considered. It is by no means certain in any individual case that radium or X-rays will cure a cancer of the womb. Some of these tumors behave very well and may disappear for a long time. Others do not seem to be very susceptible to radiation. It is impossible to tell beforehand which one will be favorably influenced, so that a radiation cure of a given tumor of any type can not be assured. On the other hand, the surgical operation may reveal what has previously been unsuspected, that the growth has extended beyond the limit of any possibility of removal and therefore surgery will fail and recurrence may take place within six months or a year with fatal results.

Another woman suffering from the same trouble, but without family responsibilities, might prefer to assume the risk of surgery with the hope of getting a permanent cure. The surgical operation should be followed, if possible, by repeated prophylactic radiations to prevent recurrence of the growth.

Definite answers can not be given as yet to this question of the best treatment for each case, for they are largely a matter for individual decision. But it must be admitted that high surgical skill is much

more generally available in the United States than a sufficient amount of radium with the necessary experience for its application. In general, therefore, the patient should choose surgery. The situation changes also with the type of tumor. For instance, cancer of the breast should never be rayed when operable, because such a growth is easily removed with excellent prospects of cure; far greater even than that claimed by those using radiation methods. The physician's obligation to his patient is such that he must recommend that which has been tried and proved good, not that which is in the experimental stage.

But we have been speaking of operable tumors of the breast. What is to be done with inoperable tumors of the breast? How can life best be prolonged and without too much suffering? There are two points of view; one is to remove the tumor as fully as possible and then trust to X-rays to prevent its returning. Radium plays no part in such post-operative treatment as its action is too local.

The other school believes that not enough is gained for the patient by surgery to warrant its use; that the operative procedure may open up lymph channels and distribute the tumor cells in these advanced cases; that it is better to say to the patient that cure is impossible, but that the growth may be slowed for a very considerable period of time by X-ray, with, if possible, the insertion of radium needles in the larger tumor masses to help in their destruction. A final decision between these two situations is not yet possible owing to the limited experience available as to the permanence of radiation cures.

One thing is certain. The capacity of radium or X-rays to arrest a tumor like cancer of the breast is not invariable. Some tumors are extremely resistant, some are indifferent, and some are extremely

susceptible. It is impossible to tell beforehand which one is going to yield. Some months are required to find out whether the tumor is susceptible or not, during which period there is always the possibility of a further distribution of the growth in the body which will render the case absolutely hopeless. If the tumor is already inoperable, this will not change the inevitable outcome, but if it is on the border line of operability much delay for the using of radiation methods is improper, for the operation should be proceeded with immediately.

Cancer in other situations, especially of internal organs, offers no chance for debate. Cancer of the stomach and intestines should always be operated upon either to cure the patient by removal of the tumor or to relieve the symptoms by freeing the obstruction. For cancer of the stomach, radium and X-rays are practically of no value. The dosage required is very heavy and other organs are apt to be damaged, so that it is possible that the life of the patient would be sacrificed to the treatment. Cancer of the stomach which can not be removed is often benefited by short-circuiting the obstructed portion, the patient sometimes living in good health four or five years after such an operation. Cancer of the bowel is of two types, carcinomatous and sarcomatous. The sarcomatous type can usually be palliated with X-rays after the removal of the tumor, but the carcinomatous type is very difficult to affect by any radiation. In the rectum the situation is somewhat different; a combination of radium and surgery may be of the greatest benefit. The surgery relieves the obstruction and the insertion of radium needles into the tumor to check its growth may give prolonged comfort and possibly an occasional cure.

An active debate is now in progress regarding the treatment of sarcomata of the long bones. Most of

these tumors are invariably fatal because they are not recognized until a very late stage and also because metastases to the lung occur very early. A group of radiologists is now recommending that all of these tumors be rayed rather than operated upon, pointing out that the chance of cure by surgery is very small. This every surgeon will grant. He also realizes that the amputation which he does is a mutilating operation. If the patient is dependent on his own exertions for support he may elect to see if radium or X-ray be of benefit to his tumor so that he may continue at work. Some radiologists object to radium in that it necessitates the opening of the tumor in order to insert this substance, and this disturbance of the tissues may set up a metastasis; hence, the tumor should be treated with X-rays alone and not by radium. There is no evidence, however, that a permanent cure has as yet been obtained with either X-rays or radium in cancer of the bone.

The situation is very much complicated by the fact that there is a certain group of these sarcomata which apparently are not highly malignant; that is, they may involve the bone and possibly cause spontaneous fracture, but they do not metastasize. They remain entirely local, and may be cured if thoroughly removed. This can be done in some cases without amputation. The difficulty lies in not being able to make a correct diagnosis in all cases without cutting into, and examining microscopically a fragment of the growth. Such tumors do very well with X-ray and radium; and when sufficient clinical experience is available so that their nature can definitely be determined by X-ray pictures or other means, many of them will undoubtedly be rayed and the patient escape an operation. Unfortunately that time has not yet come. Even expert pathologists and sur-

geons disagree as to the malignancy of some tumors of this group, and it is probable that the nature or quality of the tumor in all instances can not possibly be determined even under the microscope. The general attitude, however, is still that it is wise to cut into the tumor and determine its nature microscopically, if possible, and to remove all that can be removed, and then treat it afterward with X-ray.

To sum up the treatment of malignant tumors: It is best to remove them completely by surgery, if possible; if such complete removal is impossible, the tumor should be treated by X-rays or radium, or both, combined, if necessary, with such surgical assistance as may aid in prolonging life or giving comfort to the patient. The choice between the two depends upon the situation of the tumor, its nature, and many other circumstances. These have to be decided for the individual patient.

It can not be repeated too often that diet, serums, or medicine of any sort does not influence the growth of cancer. The various forms of ultra-violet light and visible light have no effect upon tumors. Tumors should never be treated with ointments, plasters, or by massage. Ointments and plasters do nothing; while massage or manipulation rapidly spreads the tumor throughout the body.

CHAPTER VII.

QUACKS

THE cancer quack is the most loathsome variety of quack, because he treats a disease which if not properly handled is inevitably fatal. He almost never cures any but small skin cancers and almost certainly takes all of the unfortunate victim's money, for the quack never treats any one free.

It is different with the quack who treats colds in the head or pains in the back or rheumatism, because these diseases are not so apt to prove fatal. The tuberculosis-cure quack is a little lower in the scale, for he may keep the patient from proper treatment, but the cancer quack is certainly the worst of the lot.

He is of two varieties: one, inside the medical profession, and the other, outside. The former is the more dangerous, for he shields himself behind the reputation of competent physicians and bears a license to practise from State authorities. For this reason he is morally far worse than the ignoramus whose intelligence can be judged by the correspondence shown in the following extracts. The simple and amiable write me letters like this:

"Dear Sir:
Cancers are Caused and Controlled by the Bowell. *Fruit,* plain food and an *honest* mind, and you will see an improvement right away
Yours truly
Miss Sarah Jones
18 Clinton Avenue
Wadsworth, N. Y."

Miss Sarah evidently has a leaning toward mind-cure methods; but, unfortunately, by taking thought one can neither add a cubit to one's stature, nor cure a cancer. I can assert from an experience of over thirty years in hospitals that there are at least two things that faith is unable to cure; these are broken bones and cancer.

The next variety comes from an engineer:

> "The Remedy and an absolute cure is
> 1 lb Bird shot
> 1 Pt Sweet milk
> Boil thoroughly and Strain off Shot through cheese cloth. 1/3 of this milk to be drank when sufficiently cool, &
> in 3 hours, 1/3 more &
> in 3 " 1/3 "
> These three doses are all that is necessary.
> Now Doctor don't scoff and say there is nothing to it, try it and see."

An adherent of the phonetic method of spelling writes as follows:

> "Dear sur I see an aCCount in the Star that there is no cure has ever Bin found yet you are Badley mistaken I have A cure for canCers I no this I have tested it I tell you the truth and nohing But the truth I can cure canCer of the stomaCh you can Eat my salve It will not hurt you mr. You say thare is 3 million dollar fund left for Any man that has A canCer cure
> I have the onley cure on earth."

The next one is a trifle more grasping, but equally phonetic in its spelling and weak in its punctuation.

> Dear sur I am not a student nor a doCtor but if you stace up 3 million dollar so it is mine when the cancer is cured Bring on your man or woman I do not care how Bad there ate up if the flesh is all gon

off arm or leg or grate holes eat out But take a canCer when it is as big as half dollar it wont make a bad show dear surs I am ready to go to work Bring the patient and cheCk put it in the Bank so it is mine when canCer is cured

from H. I. Kennedy
Burlington, Kans

answer at onCe."

How any intelligent person can be humbugged by such ignorant and rapacious creatures when he can go to an intelligent physician who has spent a large part of his life in attaining an education which fits him to make correct diagnoses and to offer suitable treatment, is one of the most puzzling phases of human psychology.

Some of the quacks who are within the boundaries of the profession use a variety of caustic pastes or plasters, and they do sometimes cure small skin cancers, tho the results are not as good as are obtained with radium or X-rays. Their advertisements tell the old story of "Curing Cancer without the knife" or "Taking it out by the roots", altho cancer has no roots. But in general they do harm; for while they are destroying the superficial portion of a cancer, extension of the growth may take place into the deeper structures, or particles may break off and go to other portions of the body where they set up fresh tumors. When this has occurred a patient's life has been sacrificed.

It is rather important also not to take the written testimonials from "cured" cases at face value, for most of these men are not capable of making a correct diagnosis or, for reasons of their own, do not want to make a correct diagnosis. They may treat many cases of simple ulcer or swellings which are not cancers, and when the thing is healed advertise

that they have cured a cancer. Many of the good people who write testimonials to such quacks are unaware of the fact that by so doing they are betraying certain unpleasant facts concerning their own lives, for the tumor may be a swelling due to a far less creditable disease than cancer.

Other medical quacks make their money by treating patients with a diet, sometimes supplemented by ointments, pastes, or other type of local application. Dietary treatment is rather old, dating back 2,000 years, when very little was known of the true nature of cancer. It has neither logical nor scientific foundation and has long since been shown to have no effect upon the growth of a cancer. In consequence the hospitals for incurables contain many of these unfortunates who have tried dietary methods until the growth has reached such a size that operation or other treatment is impossible, and the patient, having spent all his money, is cast out of the quack's office to become an object of charity.

The advertising skill of some of these quacks is worthy of a better cause. They write letters to the newspapers pointing out that surgery has not diminished the recorded death rate from cancer, a statement which is true, as explained elsewhere in this book; but they use the fact as an argument that, therefore, surgery is of no value, whereas it is well known that thousands of people are cured every year in the United States by surgery. They point out that the number of cases of cancer in a city is increasing from year to year despite the presence of a large number of hospitals, but the ordinary layman does not always recollect that inasmuch as the population of a city is obviously increasing, the number of cases of cancer also increases, just as the number of automobile accidents increases with the population, and the number of cases of appendicitis or

pneumonia. But the true cancer rate remains the same.

Some of the more crafty offer money in payment for lists of names of persons who have lumps of any sort. Then when the victim of cancer gets a personal and sympathetic letter from the quack telling him that he can be cured for a certain sum, he is very apt to snap at the bait, especially if he has been told by a reputable physician that he is incurable. Usually the money has to be paid in advance, and nothing more is heard of it; but occasionaliy the court-room reveals the sordid details of the contract when the family refuses to pay a large sum out of a dead man's estate. The recent publicity campaigns in the United States concerning the nature of cancer and its treatment have unfortunately increased the business of these gentry, for many people who read about the dangers of cancer and the proper means of cure, instead of taking this advice, go to the nearest quack, whose business is thereby increased.

One of the most extraordinary examples of quack methods which is now much heard of in this country consists of diagnosing cancer by an electrical machine which is some thousands of miles distant. If you were to tell one of these victims that a punctured tire on his automobile could be repaired by a man somewhere on the other side of the world working an electrical apparatus, he would regard you as a fool, and probably say so; yet he will spend hundreds of dollars to have a cancer diagnosed and treated by the same means. But as long as a certain portion of the population desire to be fooled and, as Barnum remarked, there is one of that portion born every minute, the quack will flourish, and people will die of maltreated cancer.

CHAPTER VIII.

CAN CANCER BE PREVENTED?

IF, as has been shown, so small a proportion of permanent cures can be obtained in comparison to the great prevalence of the disease, it is very pertinent to ask, "Can medical science offer any suggestion in regard to the prevention of cancer?" The answer is, "Yes, much can be done."

It is perfectly obvious that most of the industrial cancers can be prevented, that is, those due to the handling of irritating substances. The best example of this is the practical disappearance of chimney-sweeps' cancer in England by 1910, owing to remedial legislation and changes in the method of cleaning chimneys. As long ago as 1775 an English surgeon, Percival Pott, described cancers arising in chimney-sweeps and gardeners. Laws were finally passed prohibiting certain methods of chimney sweeping and as the construction of buildings changed, the occupation of the sweep, who used to go down the chimney naked and thus become thoroughly covered with soot, has ceased. With these changes soot cancer has become rare.

On the other hand, the handling of tar has become an increasingly important occupation, both in the gas works and in the briquet factories where coal dust is compressed into cakes, using tar as a binding medium. Cancer of the hand or forearm is not uncommon among such workers, and the only means of preventing it is to pick out those who develop chronic thickening of the skin and who are therefore

susceptible to this irritant and place them in some other trade.

The anilin dye worker's cancer, which is very frequent in the factories of Germany, has been partially controlled by transferring the workmen from certain processes, which have been found to be dangerous, to others, thus not keeping a man long in that part of the factory in which the irritating substance is produced.

The irritation which causes chronic skin disease in those working with crude petroleum can also be controlled by suitable cleanliness and rotation of work. Prompt treatment of spatter burns, caused by the breaking or upsetting of crucibles containing fluid metal, has resulted in the diminution of cancer arising on the basis of the non-healing of such burns.

Cancers which arise from social habits, such as those from the Kangri basket burns or betel-nut chewing, can also be controlled by suitable legislation should the population be willing to subject themselves to regulation.

The dangers of Roentgen rays and radium in producing chronic dermatitis in those exposed in the manufacture or use of these two agents are now sufficiently well known so that in the future this type of injury, with the resulting cancer, will certainly disappear, for proper protection is now universal.

The medical care of chronic leg ulcers, which are so frequent in old people who are employed in work which requires them to stand a great part of the time, will reduce the occurrence of cancer of this type.

Proper dentistry will diminish cancer of the tongue and mouth by preventing irritation from rough sharp-edged teeth or from ill-fitting dental apparatus. In this connection, also, the active treatment of any syphilitic taint will reduce the liability of a person

who has this disease to cancer of the tongue or mouth.

Care in the use of tobacco and changes in the habit of smoking have already produced a diminution in epithelioma, the most common type of cancer, of the lip. The pipe smokers' cancer, tho still seen both in men and women in Ireland, has practically disappeared in this country, because short clay pipes are no longer used here. Those who are extremely sensitive to tobacco should avoid its use. Persons having moles or warts on the face where they are liable to be cut in shaving should have these projections removed by surgery in order to avoid the irritation which occurs when they are injured repeatedly. Warts and moles when they are in a situation where they are constantly rubbed by the clothing, occasionally change into cancer and therefore should be removed. Others not so situated may safely be left, but should be carefully watched and on the slightest appearance of an increase in size, should be cut out. They should not be treated by caustics, electricity, X-rays, or radium, as they are extremely resistant to this form of treatment. Any rough spot in the skin of the face in those over 50 should be very carefully watched; the small brownish thickenings of the skin so frequent in old people should, if possible, be treated by radium or X-ray before they change into cancer.

In the early stages, before cancer really begins, such pigmented thickenings are very easily cured by radiation, and this is the time to apply treatment. The patient should not wait until the growth ulcerates or grows deeply into the tissues of the face. It should not be picked or treated with salves. It should be cared for properly and by this means prevented from going on into a true cancer, which is then much more difficult to cure and may require an

extensive operation, or severe radium or X-ray treatment.

Unfortunately, most types of cancer arise on the basis of irritations which are not so easily controlled. For example, cancer of the stomach unquestionably not infrequently begins in a small ulcer which does not give any symptoms to call attention to the condition. Whether ulcers of the stomach are due largely to irritating food or whether they follow bacterial or vascular disease is not yet finally decided. But in any case highly spiced food and excessive quantities of pepper and other condiments should be avoided. Symptoms suggesting ulcer should lead to very prompt treatment of the disease in any one over the age of 40. If medical treatment is not sufficient to cure in a short time, the ulcer should be removed surgically.

Inasmuch as a considerable portion of cancers of the lower bowel are directly traceable to inflammatory troubles in that region, prompt attention should be given to the cure of dysentery or of chronic inflammatory lesions such as diverticulitis.

Women who have borne children are especially liable to cancer of the neck of the womb, and as this probably arises in tears produced by childbirth, such tears should be promptly sewed up at the time of delivery. If evidence of chronic inflammation such as leucorrhea or other types of discharge exist, the injury should be repaired by surgical means, in order to avoid such chronic irritation as may ultimately lead to cancer. Gall-stones are frequently associated with cancer and should be removed. Chronic inflammation with the formation of irregular hard fibrous masses in the breast, if present in a person over 40, should be thoroughly examined at least once a year by a competent surgeon with the idea of having

the masses removed if they start to grow, as cancer frequently arises in such inflamed tissue.

As the cause of the sarcomata of the bones and other tissues is still unknown, except in rare instances, no advice as to possible prevention can be given.

All these facts point to the necessity of careful medical examination at least once a year in persons over forty-five. Those who belong to a family in which cancer is frequent should be especially careful in having a routine examination by a competent physician. It is strange to see people who spend large amounts of time and money in obtaining elaborate dentistry, or promptly employ a veterinary surgeon to look over their pet animals in case they are diseased, or send their automobiles to a garage to have the cylinders cleaned or the brakes tightened, without a thought of the expense, but who do not consult a physician, who costs on the average much less than a garage mechanic, to see if their own bodies are kept in condition.

It has been estimated that, assuming the total cancer death rate in the United States as 90,000 persons per annum, 4,000 tumors occur in the mouth, 3,500 in the skin, and 9,000 in the breast, a total of 16,500 growths which are easily seen or felt. If cancer in any of these sites is treated within the first few weeks after its appearance, at least 90 per cent. of such persons can be permanently cured, and thus some 15,000 lives saved by the exercise of only reasonable intelligence. Yet the fact that such reasonable intelligence is not exerted is shown by the still rising total death rate from these superficial and accessible cancers. True, the rate for cancer of the skin has not increased in recent years, and that of the breast only slightly, but cancer of the mouth shows a considerable elevation. People are evidently

beginning to take notice of warning signs; but despite this fact the death rate in these accessible groups is still much too high. The next ten years should demonstrate the effects of education.

Conclusions

The chief facts concerning cancer which every one should keep in mind are:

Only early cancer is curable.
The disease is universal; so every one is liable.
The diagnosis is difficult; therefore consult a good physician as soon as symptoms are noticed.
Surgery is still the most certain method of cure.